

REMARKS

Reconsideration of this application is respectfully requested in view of the foregoing amendment and the following remarks.

By the foregoing amendment, claims 1, 8, 9, 11 and 12 have been amended. Claims 3-7 have been withdrawn from consideration. Thus, claims 1, 2 and 8-12 are currently pending in the application and subject to examination.

Informal Matters

In the Office Action mailed April 6, 2007, the Examiner rejected claim 1 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner has asserted that the limitation “pores formed by said pore forming member, equal to or greater than 6.0 $\mu\text{l}/\text{cm}^2 \text{ mg}$ ” is unclear. Claim 1 has been amended responsive to this rejection. In addition, the Applicants note that the unit $\mu\text{l}/\text{cm}^2 \text{ mg}$ represents the spatial volume of pores per unit area of the catalyst and also per unit mass of the catalyst. When assessing the performance of a catalytic reaction, it is important to see the ability of providing gas to the catalyst as well as emitting water. Also see the specification at, e.g., page 5, line 18 – page 6, line 23 (particularly page 6, lines 8-23). If any additional amendment is necessary to overcome the rejection, the Examiner is requested to contact the Applicant's undersigned representative.

Rejections Under 35 U.S.C. § 103(a)

Claims 1 and 2 were rejected under 35 U.S.C. 103(a) as being unpatentable over Denton et al. (U.S. Patent 6,010,606) in view of Gorman et al. (U.S. Pre-Grant Publication 2002/0086195). Claims 8-12 were rejected under 35 U.S.C. 103(a) as

being unpatentable over Denton et al. and BBC-Weather Centre. It is noted that claims 1, 8, 9, 11 and 12 have been amended. To the extent that the rejections remain applicable to the claims currently pending, the Applicant hereby traverses the rejections, as follows.

Claim 1 is directed to a membrane-electrode structure, claim 8 is directed to a polymer electrolyte fuel cell having a membrane-electrode structure, claim 11 is directed to an electric appliance utilizing a polymer electrolyte fuel cell having a membrane-electrode structure, and claim 12 is directed to a transport machine utilizing a polymer electrolyte fuel cell having a membrane-electrode structure.

In each of independent claims 1, 8, 11 and 12, as amended, the membrane-electrode structure includes an anode electrode; a cathode electrode; and a polymer electrolyte membrane made of a sulfonated polyarylene based polymer held between the anode electrode and the cathode electrode, and a fuel gas is supplied to the anode electrode, an oxidant gas of 50% or more in relative humidity is supplied to the cathode electrode, and electric power is thereby generated under a highly humidified condition. In each of claims 8, 11 and 12, the claimed cathode electrode includes an electrode catalyst layer containing a catalyst particle having the catalyst loaded on carbon particles, a pore forming member and an ion conducting polymer that is in contact with the polymer electrolyte membrane through the electrode catalyst layer, wherein a ratio of the weight of the ion conducting polymer to the weight of the carbon particles falls within the range of from 1.4 to 1.8. In addition, in each of claims 8, 11 and 12, the claimed electrode catalyst layer has pores formed therein by the pore forming member,

and a total sum volume of the pores that have a pore diameter within a range of from 0.01 to 30 μm is equal to or greater than 6.0 $\mu\text{l}/\text{cm}^2$ mg catalyst.

Further, in claims 8, 11 and 12, the pores formed by the pore forming member have a pore diameter distribution comprising a first peak falling within the pore diameter range of from 0.01 to 0.1 μm and a second peak falling within the pore diameter range of from 0.1 to 1.0 μm , the height of the first peak being lower than the height of the second peak.

By the pore volumes in the electrode catalyst layer falling within the claimed range, it is possible to prevent unnecessary water from being accumulated at the electrode catalyst layer, therefore, to obtain excellent electric power generation ability (see, e.g., Figs. 5 and 8 of the instant application).

The Applicant submits that none of the applied art of record, nor any combination thereof, discloses or suggests the range of pore volumes in the electrode catalyst layer as recited in the claimed invention.

The Office Action asserts that the ratio of the weight of the ion conducting polymer to the weight of the carbon particles is 2 in Denton, and that the difference in the numeric value is too minor to distinguish the claimed invention over Denton. However, as is apparent from Fig. 4 of the present application, the numerical range of the ratio recited in the claimed invention exerts superior improvement in electric power generation ability compared to that of Denton.

Further, although Gorman discloses the existence of a water management problem in fuel cells, the acknowledgement of such problem alone does not lead to the solution discovered by the inventors of the claimed invention.

Moreover, none of the applied art of record discloses or suggests the use of sulfonated polyarylene in the electrolyte membrane. The problem solved by the claimed invention, i.e., maintaining a large amount of water while restricting unnecessary water from being accumulated at the electrode catalyst layer, is a problem specific to a fuel cell using an electrolyte membrane using sulfonated polyarylene, and does not occur in fuel cells using a perfluoro-type electrolysis membrane, as is the case in the applied art of record.

Accordingly, none of the applied art of record, nor any combination thereof, discloses or suggests at least a polymer electrolyte membrane made of a sulfonated polyarylene based polymer and held between both electrodes, wherein a fuel gas is supplied to said anode electrode, an oxidant gas of 50% or more in relative humidity is supplied to said cathode electrode and electric power is thereby generated under a highly humidified condition, and wherein said cathode electrode comprises an electrode catalyst layer containing a catalyst particle having the catalyst loaded on carbon particles, a pore forming member and an ion conducting polymer that is in contact with said polymer electrolyte membrane through said electrode catalyst layer, a ratio of the weight of the ion conducting polymer to the weight of the carbon particles falling within the range of from 1.4 to 1.8; said electrode catalyst layer having pores formed therein by the pore forming member, and a total sum volume of the pores that have a pore diameter within a range of from 0.01 to 30 μm is equal to or greater than 6.0 $\mu\text{l}/\text{cm}^2$ mg catalyst, as recited in claims 1, 8, 11 and 12, as amended.

To qualify as prior art under 35 U.S.C. §102, a single reference must teach, i.e., identically describe, each feature of a rejected claim. Moreover, to establish *prima facie*

obviousness of a rejected claim, the applied art of record must teach or suggest each feature of a rejected claim. See *M.P.E.P. §2143.03 and In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998)*. As explained above, none of the applied art of record, nor any combination thereof, discloses or suggests each and every feature recited in independent claims 1, 8, 11 and 12. For at least this reason, the Applicant submits that independent claims 1, 8, 11 and 12 are allowable over the applied art of record. As claims 1 and 8 are allowable, the Applicants submit that claims 2 and 9-10, which depend from allowable claims 1 and 8, respectively, are likewise allowable for at least the reasons set forth above with respect to claims 1 and 8.

Conclusion

For all of the above reasons, it is respectfully submitted that the claims now pending patentability distinguish the present invention from the cited references. Accordingly, reconsideration and withdrawal of the outstanding rejections and an issuance of a Notice of Allowance are earnestly solicited.

Should the Examiner determine that any further action is necessary to place this application into better form, the Examiner is invited to contact the undersigned representative at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants hereby petition for an appropriate extension of time. The Commissioner is hereby authorized to charge any fee deficiency or credit any overpayment associated with this

communication to Deposit Account No. 01-2300 referencing client matter number
101175-00041.

Respectfully submitted,

Arent Fox, LLP

A handwritten signature in black ink, appearing to read 'Michele L. Connell', written over a horizontal line.

Michele L. Connell
Registration No. 52,763

25,885

Customer No. 004372
1050 Connecticut Ave., N.W.
Suite 400
Washington, D.C. 20036-5339
Telephone No. (202) 857-6104
Facsimile No. (202) 857-6395

MLC:cdw

Enclosures: Petition for Extension of Time